



CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on 3/15/99

Julia Bell

Exhibit 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT application of: )  
April Gulbrandson KOHRT ) Examiner: H. T. Vo  
Serial No. 08/951,754 ) Art Unit No. 3747  
Filed: October 16, 1997 )  
For: INTAKE AIR HEATER AND )  
AIR DELIVERY ASSEMBLY )  
FOR ENGINES )  
)

Honorable Assistant Commissioner for Patents  
Washington, D.C. 20231

DECLARATION OF APRIL G. KOHRT

I, APRIL G. KOHRT, declare as follows:

1. I was employed by Cummins Engine Company, Inc. (Cummins) from November 8, 1991 to May 29, 1996 which included the period covering the design, development and implementation of the subject invention.

2. I was the lead project engineer on the Intake Air Heater Development Project, whose purpose was to implement a drop down heating device for use in the cylinder head of an internal combustion engine.

3. The document attached as Exhibit A is a true and accurate copy of an email message that I sent to Rich Franzwa and Donna Virnig (other Cummins employees) on November 15, 1993. In that message I simply reported my finding that it was technically feasible to add an electric grid heater to the C-Series engines then being developed and manufactured by Cummins.

4. The document attached at Exhibit B is a true and accurate copy of an email message sent to me from Sean Milloy on or about December 10, 1993 that describes the progress thus far achieved on the C-Series engine development. Page 3 of that memo describes my focus up to that point which was to place a grid heater on top of the engine manifold by using a grid or spacer. The memo also states that that particular approach would have added 1.5 inches to the current engine envelope.

5. The document attached at Exhibit C is a true and accurate copy of a PRO-E drawing of the original spacer air intake heater concept discussed in Exhibit B.

6. The concept of dropping the grid heater into the intake manifold was conceived no later than April 26, 1994. It was at that time that I prepared the drawing attached as Exhibit D. The date on the drawing shows its date of origination. The drawing was prepared in anticipation of the C Series Air Intake Electric Grid Heater Design Review that was conducted no later than April 27, 1994. Prior to the design review, I searched for a solution to solving the problem of the high design profile caused by the conventional intake air heaters and the concern that the new C Series Intake Air Heater as designed, might prevent our engines from fitting into existing C-Series engine compartments.

7. The document attached as Exhibit E is a true and correct copy of the design review meeting minutes drafted no later than Thursday, April 28,

1994. I drafted the minutes to accurately chronicle the agreements that had been made the day before at the design review. Paragraph 1 of the meeting minutes lists the attendees of the design review including Steve DeLarosby and Gordon L. Kelling of Phillips & Temro. Paragraph 9 of the meeting minutes alludes to my investigation of the design concept for an intake heater that has grids dropped into the intake manifold.

8. The documents attached at Exhibit F are true and accurate copies of email messages exchanged between Rich Franzwa and I concerning delivery of the first grid heater prototype to the factory on March 22, 1994. This prototype delivery allowed Rich Franzwa and the other designers at the factory to complete activities necessary to begin production of C-Series engines containing the grid heater.

9. The document attached at Exhibit G is a true and accurate copy of an email message that I drafted to inform interested parties that the second prototype of the grid heater had been received on November 23, 1994.

10. The document attached at Exhibit H is a true and accurate copy of a PRO-E drawing with associated engineering drawings of the second prototype discussed in Exhibit G.

11. Attached at Exhibit I is a true and accurate copy of a cover page of Engineering Release No. 953068-056. The Engineering Release is drafted and approved when an engineering development project is ready to be released to the factory for production. I generated this Engineering Release once the development and testing of the grid heater was complete. This Engineering Release, as shown in the discussion, concerned the release of the 24 and 12 volt electric grid heaters.

12. Attached at Exhibit J is a true and accurate copy of a print out from the Cummins Information Tracking System which shows the date the Engineering Release shown in Exhibit I was written. As is obvious from the

print out, the Engineering Release was written on March 2, 1995 and it was later approved for production on August 15, 1995.

13. The document attached at Exhibit K is a true and accurate copy of a PRO-E drawing of the intake air heater referred to in the Engineering Release of Exhibit I.

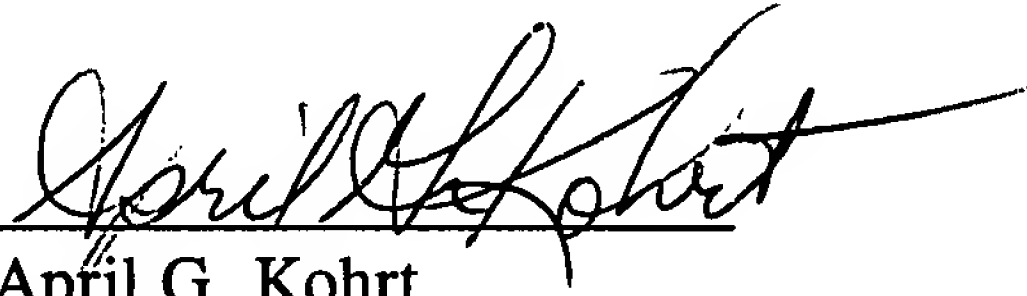
14. Attached at Exhibit L is a true and accurate copy of the facsimile I sent to Tim Brackett, a patent attorney, on October 27, 1995. The facsimile consisted of drawings of the intake air heater that were to be used as part of the patent application.

15. Attached at Exhibit M are true and accurate copies of email messages the I sent to various individuals including Jan P. Thimmesch (see distribution) from September 28, 1994 to October 11, 1994.

16. As can be seen from the enclosed exhibits, the project was broken into a series of tasks and subtasks, all of which related to moving the Drop Down Intake Air Heater from conception to reduction to practice to full scale engineering production. While the schedule did slip from time to time, we did diligently attempt to reduce the Intake Air Heater to practice, and in fact to move it into production, from at least as early as March 2, 1995 until its production in August 1995.

17. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 02/27/1999

  
April G. Kohrt

016 OAR      PASS 11/15/93 15:55 A G Kohrt - technically feasible

OCT. 13, 1998    DOC-NAME : 8259154-19931115      TIME: 3:23 PM  
DATE: November 15, 1993  
TO : Ms. X. OAR  
FROM: A.G. KOHRT  
SUBJECT: PCR MR2837

Adding an electric grid heater to C-Series naturally aspirated, JWAC, and turbocharged engines is technically feasible.

A. G. KOHRT

CC : D.M. Virnig

A handwritten signature and initials. The initials "AG" are circled, and a signature is written below them.A handwritten letter "A" in the top right corner of the page.

pg 3

B

DATE: December 10, 1993  
TO : DIST-C  
DIST-PESEDC  
FROM: S.C. Milloy  
SUBJECT: C Series November Newsnotes

#### 1994 Introduction

The C Series passed the M5 management review in November with the following Midrange engineering issues highlighted:

- \* Delay of certification the 300-C Rating  
Since the M5, certification of this rating has been completed on the revised schedule and release of this rating is still being worked.
- \* Amount of field test time on "production" intake heater hardware  
While we have been through one winter season with prototype hardware, we do not have enough field test time on production hardware to understand differences achieved in the field from improvements made in the design.  
To gain results quicker, additional field test units have been chosen for this winter at COTA(Columbus Ohio transit authority). Currently, 67 C powered transit buses are being upfit with hardware which has been programed to cycle every time bus is started to accelerate the test. Other field test units are being upfit as well to gather more data.

Certification is now complete on all three 94C engine families. During November the 300C family successfully completed Certification. The final certification results for all three families are as follows:

Family	Rating	PM	NOx
-----	-----	-----	-----
413E	300C	.08	4.8
413F	High Torque	.066	4.48
413G	Low Torque	.087	4.79

The 94C 300hp rating was revised just prior to Certification testing due to problems with secondary injections at rated. The problem was resolved by changing the CV delivery valve retraction from 150mm3 to 180mm3. Vehicle testing in a Ford LN8000 tractor with 60,000 gvw produced no idle instabilities, and low idle backup appeared to be adequate. Idle stability was a concern in changing to the higher retraction delivery DV. A full vehicle drivability and stability test will be scheduled with CTC as soon as more fuel pump samples are available.

ISIR of 94C 210 and 225 hp ratings is in process at CDC and METC. Initial data indicates adjustment of full load fueling will be necessary for both ratings. Emissions testing at METC of a 210HP engine has indicated NOx emissions are higher than expected. Cylinder head swirl and test cell measurements are being investigated. Particulate emissions appear to be in the around 0.08 as expected.

#### Transit Bus

Certification has been completed on the 94 Transit Bus product. Due to emissions compliance issues with the 275Hp/860ft-lb and 250Hp/660ft-lb ratings, the 275Hp/800ft-lb rating will be the only rating released for Jan94

production. The more stringent PM (.07 g/BHp-hr) and Curb Idle Torque requirement which negatively impacts NOx are the reason for not offering the other ratings at this time. The transit bus certification levels are:

Rating	PM	NOx
-----	-----	-----
275/800	.048	4.68
Regulation	.07	5.0

Transient response of the transit bus product is the only significant field issue at this time. The use of #1 fuel has been identified as a major contributor to the poor response. The majority of bus authorities use #1 fuel to limit smoke/emissions on past diesel products. Engineering is developing a transit bus rating specifically for #1 fuel only that will achieve the same level of response as the #2 fuel rating with the same emissions levels. This will require a separate rating under the same emissions family.

Other issues to address the transient response have been identified and resolved. Changes include increasing rear end ratio on all future bus builds and improve system throttle response.

#### EDISON/RP43

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The Edison RP43 program is now progressing towards the following lead rating availability dates

C Series automotive..... January, 1996  
C Series industrial..... July, 1996  
C Series Case ..... October, 1996

There will not be any B Series electronically governed ratings released ahead of Encore.

Edison RP43 incorporates two new key features desired by automotive customers: injection timing control and J1939 datalink. These two features will allow the C Series to attain improved fuel economy through timing control and the J199 data link will be compatible with automatic-manual transmissions (AMTs) now under development by Eaton and Dana.

Several extensive changes are required to apply the RP43:

- |                              |                                  |
|------------------------------|----------------------------------|
| * NBF needle movement sensor | *TDC sensor                      |
| * wiring harness             | * rear tail support              |
| * high pressure fuel lines   | * low pressure fuel lines        |
| * ductile iron gear case     | * CM520 circuit/software changes |
| * EHAB shutdown valve        |                                  |

Design work is progressing on the Edison II concept drawings for the RP 43 fuel pump mounting. A ductile iron gear housing will be designed and procured for this project as the current aluminum housing is marginal for the increased load. Thus far, with a slight modification to the pump, both the Bendix 550 (used by Ford) and the Holset QE compressors will fit with the RP 43. The Midland compressor would require a large cut out on the pump and this is being studied further.

#### Industrial Emissions

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Development of the 260Hp #1 curve for the 6CTA has resulted in excessive peak torque due to the natural hydraulics of the P3000 fuel pump. Several attempts by Bosch to revise the pump specifications have failed to provide the torque reductions needed to reduce thermal loading at peak torque. Two options are available to correct the situation.



- Utilize a RKQK governor which provides for negative torque control. The RQVK would also provide reduce throttle pedal forces (RSV is very stiff) and low speed stability improvements over the RSV. However, the RQVK is a significant cost penalty (approx \$200).
- Utilize the LDA to control fuelling from 1600rpm and below. This would require an increase in peak torque speed from 1500 to 1700rpm. This would also reduce NOx and possibly allow for an increase in engine timing to improve BSFC and heat rejection. Engineering are investigating this option with the applications and marketing groups to understand if any application issues exist.

Industrial Emissions work on fuel pump lines, FE lines and drain lines is progressing. Komatsu is requesting the use of a grid heater on these engines to avoid the use of ether as a cold start device. A proposal to use either the grid or a spacer has been made to Industrial Applications. This would decrease proliferation by having only one set of fuel lines, etc. However, this has a 1.5 inch impact on engine envelope which is being studied by Applications.

#### 6CT Emission Program -

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We have now successfully met all of the power, smoke and emission targets for the CT product. We are however, 15 points higher than anticipated BSFC. Current BSFC puts us at 0.400 lb/hp-hr. Looking at ways to improve BSFC. We received from Holset a new 17cm2 turbine casing equipped with EWM. This is being tested presently.

#### EuroNoise

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Field testing of the oil pan enclosure has been successfully started. Pan enclosures will be an important part of the noise reduction package to meet the european noise regulations.

Bedplate and fuel pump drive damper drawings targeted toward the EuroNoise program are well underway and should be complete before the end of the year.

Work has been started on testing the effects of close fitting emralon coated pistons to reduce mechanical noise due to piston slap. Early testing shows the greatest noise reduction gains in light to no load conditions. The first engine has shown .5-1.5 dB reduction in 1 meter noise depending on the speed. Currently, the engine is scheduled for endurance testing after which the pistons/liner will be analyzed. If successful, driveby and additional durability testing will be started.

#### Current Product

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##### Cylinder Head Swirl

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Recent audit of production cylinder heads has indicated that a number of heads were produced (and used in production) with higher than specification swirl levels. The swirl shift did not cause NOx compliance to exceed our FEL's for the current 93 emissions product. However, the 94 product does not currently have sufficient margin to allow usage of cylinder heads with excessive swirl. This clearly indicates concern over the current process controls in the foundry and production plant. Current heads are satisfactory, but a root cause must be determined and actions taken to avoid a repeat of this condition in the future.

#### C Block Casting Change (Edison, EuroNoise, Thrust Brg, Thermostat, Frt End)

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Changes to the C Series engine block casting to incorporate several design

changes driven by several programs. Block casting changes include modifications for the Edison and EuroNoise programs as well as upgrades for thermostat/alternator alignment, thrust bearing support, and the front end upgrade.

FMB has completed new permanent tooling reflecting these changes. ISIR activity is underway. Other source approval activity is on-plan with engine testing underway. Introduction timing is expected to be in February. Navistar are establishing plans to modify existing tooling during the holiday shutdown. A engineering and manufacturing plan exists for expedited approval of the Navistar tooling.

#### Champion Crank Failure Investigation

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Investigation of the three crank failures on Champion graders is still underway. The root cause is believed to be a dynamic bending load imposed on the rear face of the crank by the Champion application. Efforts to identify how the load is applied and correct the situation have been only partially successful. Test data from a field visit to a problem site and a live engine rig is being analyzed. If the results are inconclusive, then dynamic crank loads will have to be measured on an actual grader.

#### Gear Damper Development

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The first two engines for geartrain vibration measurements have been upfitted with the necessary test/instrumentation hardware. The first engine is in the test cell. A problem with the instrumentation fixture is currently being corrected and then the baseline test will be run.

#### Marine Mount

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A trip to Charleston SC to discuss experimental test procedures and collect strain data on the modified front support for the 400 Hp Marine product was made in mid-November. The front support data was used to evaluate and finalize the 3897029 design. The drawing for this support is now in CMU drafting and is being released at "P" status by CMU0008.

The hardware needed by CMU to collect strain data in the future was discussed and the mandatory items were listed to assist getting CMU capable.

#### External Oiling -

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The engineering release has been submitted to make the modified A pump with increased internal oiling the standard. Because of a discrepancy in the field testing, four new pumps with the drilling modifications have been ordered and will go out on field test. Our data indicates that the oil level in the fuel pump is sufficient to prevent governor wear. The question that has come up is whether there is sufficient oil to dampen some low idle surge problems that external oiling has resolved. The four pumps ordered will be going into the field in applications where this type of problem is well documented.

#### CDC Product Engineering Activity

##### ~~~~~ PCR 2705 Flexplate:

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Fatigue testing continues on the glued assembly flexplate P/N 3926123. Testing is being conducted at the supplier's facility. Two test samples have been completed with the failure mode being cracks around the crank holes at 4 million cycles.

Near-net Cast Flywheel:

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D release written for near-net cast flywheel ER 931500-081. Flywheel P/N 3925872 will replace the current 3909939 flywheel. Balance study completed at supplier. New flywheels balanced within the current 9939 balance specification. Plan to write L release and schedule design review.

Edison Block:

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Residual stress work has been completed on the C Series FMB block to evaluate changes associated with the Edison program. 7 places were checked in the revised areas with no unacceptable residual stresses found. This pattern change will include several block improvements. CDC has machined 6 blocks with acceptable results. A deviation to use 300 of the pattern G castings has been issued to give CDC additional blocks for machining evaluation and assembly studies.

DSO

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930005- 6C LF670 Full-Flow & Glacier 36SE Spinner II Bypass Lube Filters

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Orders confirmed for Ford/Con-Way units. Release work to commence. Fleetguard LF670 to mount at Lube Cooler Cover Filter Head. Spinner II to be chassis mounted and procured and installed by Ford distributor. LF670 requires use of adapter unit currently released for L10 engines. Spinner II oil usage is 1 GPM at rated speed.

930006- 6C Vertical Water Filter

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Orders confirmed for Ford/Con-Way units. Investigating currently released options for acceptability.

930007- 6C Engine Mounted Davco Fuel Filter

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Orders confirmed for Ford/Ryder units. Design/release work to commence.

GENERAL

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CalComp Plotter

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Purchased CalComp DrawingMaster 52436 plotter to support Pro/ENGINEER. The plotter should be received at the dock by 12/1/93.

C-Series Valve Cover

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Issued ER 931500-139 making changes to the C-Series valve cover. Changes include improvements to solve installation and interference issues and also to provide self-tapping bosses to secure BERU wiring harnesses. A 500 piece sample of covers reworked to this design were evaluated on the Assembly line with no interferences or assembly issues. Without this rework typically 3 to 5 percent of the covers experience an interference problem requiring replacement.

TRAINING

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Most members of Product Engineering attended training for Product Safety Hazard Analysis given by Lee Trexler and Product Liability given by Gary Brisbin. Other training also received by some included: Classification of

Characteristics; Design Review; Failure Modes and Effects Analysis; PDCA  
(Plan, Do, Check, Action); Statistical Data Gathering; Pareto Diagrams;  
Cause and Effect; 2 day CPS.

S. C. Milloy

CC : DIST-CNEWS

DIST-CCPE

DIST-\*C

Alyanak, E J  
Bush, E E  
Hager, F M  
LIN, C S  
Milloy, S C  
Ritzline, L A  
Wolff, K  
Sowerby, P  
SIDUR, C I  
ROGERS, D G  
Yager, J H  
SEVAKIS, A M  
GASTON, N  
GOHR, L R  
DOWNING, D H

Buchanan, J C  
FRANZWA, R A  
Johansen, G A  
Marthaler, M J  
Neil, S W  
Virnig, D M  
Klaus, J G  
Doup, Doug  
CORT, A  
Weikert, J M  
BUSCH, D A  
CONLEY, J P  
BEYER, M A  
Hovin, L E  
KOHRT, A G

More..

DIST-\*PESEDC

Allen, W C  
BEYER, S  
Coggins, H F  
Collie, T R  
Denton-Jr, J W  
Dover, R G  
FISHER, K J  
JOHNSON, J H  
KRASZESKI, D J  
LEBEGUE, J S  
Long, D G  
Menard, J D  
PANETTIERI, R A  
ROSSI, R A  
UNSWORTH, J P

Alston, G  
BUEL, T J  
Cole, J A  
Deeds, J T  
Dickens, D T  
Faison, K  
FRANZWA, R A  
Kloosterman, G C  
LANG, M  
Ley, C J  
MARINO, T R  
Murvin, E T  
Richardson, L A  
Stith-Farmer, M  
WALKER, S G

More..

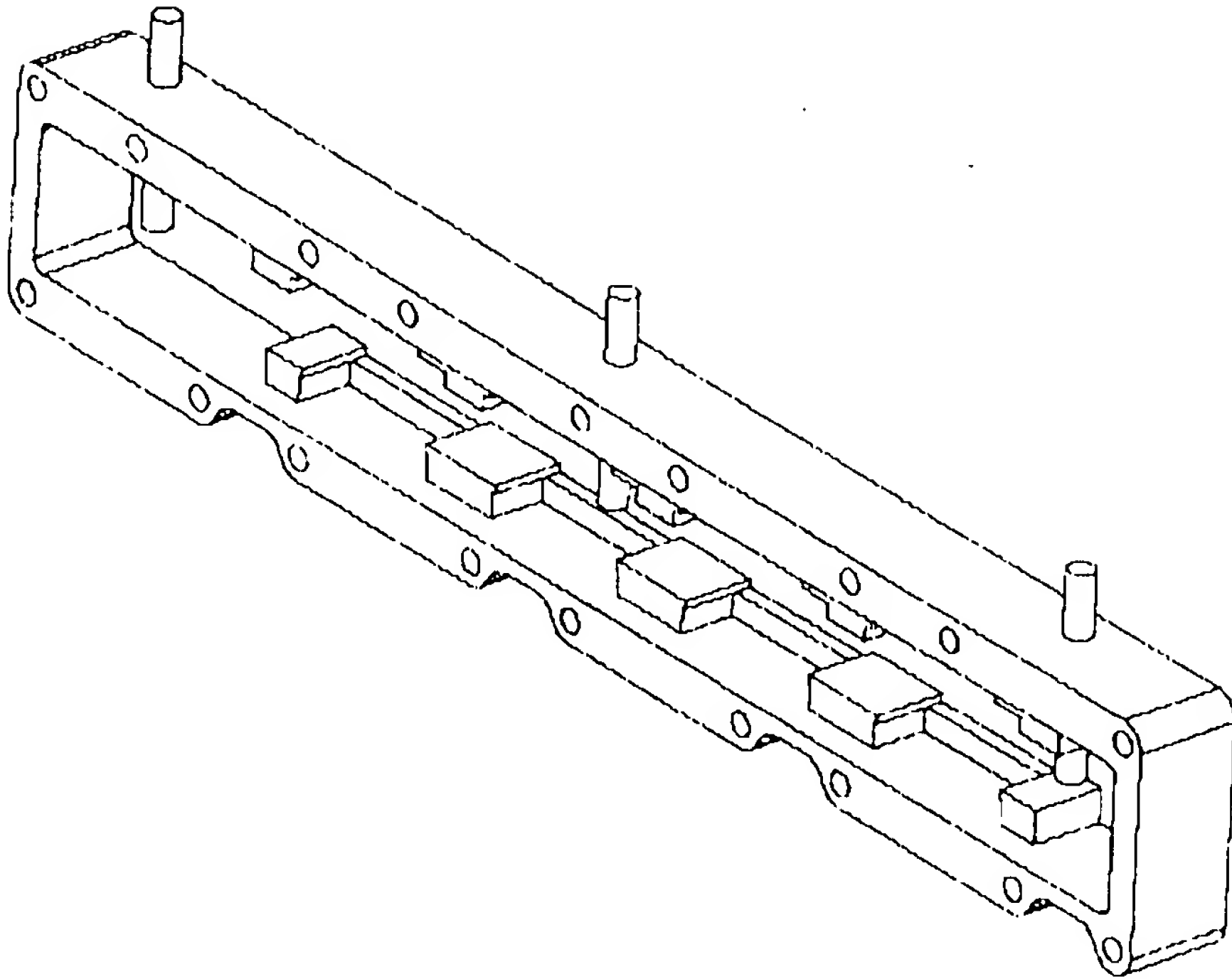
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Bolina, A O  
Bean, S W  
Yager, J H  
GALE, T J  
MANDT, B

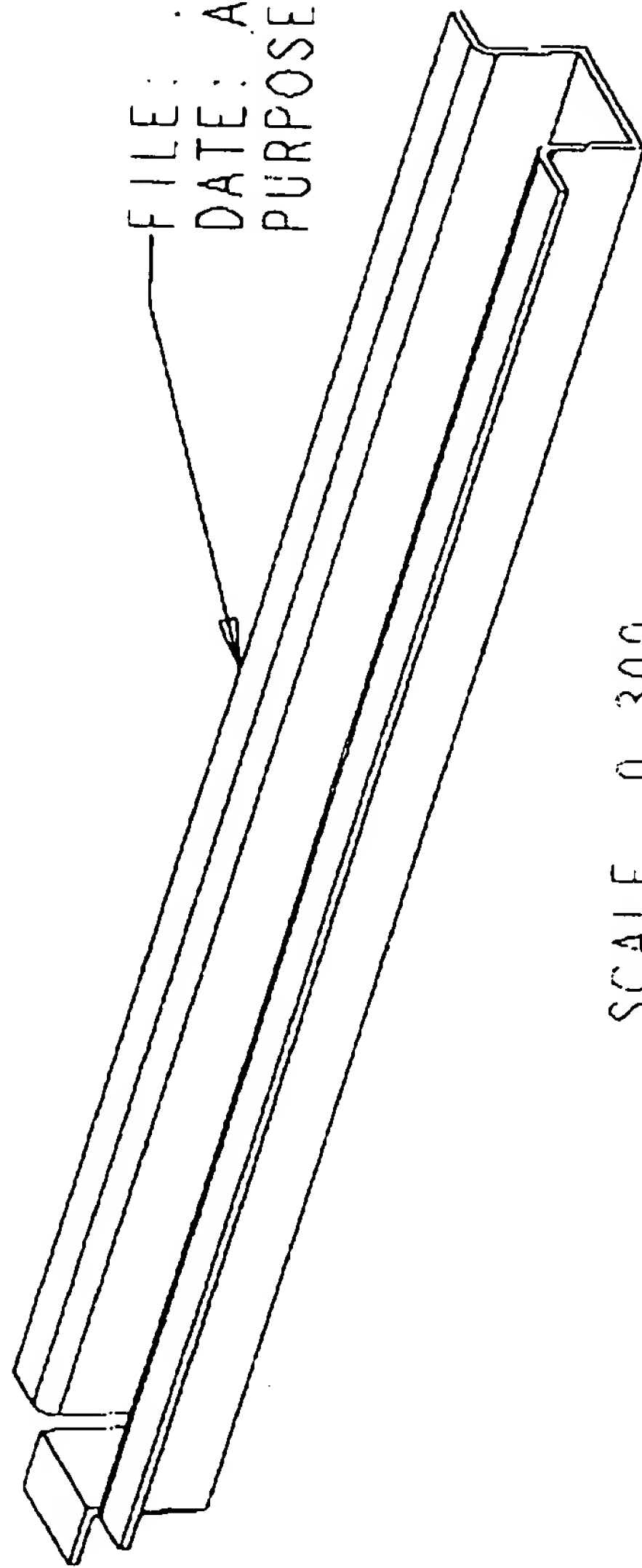
PASQUOTTO, L A  
Molewyk, T L  
Bose, T N  
Herlitz, D L  
SOULTZ, B L  
Barrett, P M

C

Pro/ENGINEER Part: 3928013 : /transfer/agk/3928013.prt.4



Original "spacer" air intake heater concept  
March 15, 1994



FILE: .../ogk/droppedgrid.prt.1  
DATE: APR L 26, 1994  
PURPOSE: INITIAL CONCEPT

SCALE 0.300

E

ATE: April 28, 1994  
O : DIST-GRID  
ROM: A.G. KOHRT (April Gulbrands)  
UBJECT: C Air intake Grid heater issues

follow up meeting on the design of the C Series Air Intake Electric Grid heater was held Wednesday afternoon, 4-27-94. In attendance: Rich Franzwa (CDC), Jim Unsworth (CDC), Steve DeLarosby (Phillips Temro), Gordon L. Kelling (Phillips Temro), Dave Downing (METC-performance), Dave Cvelbar (METC-Design), Suzanne Andreasen (Phillips Temro), Duane Busch (METC-Stress Analysis), Marty Chiaramonte (METC-Service), Doug Doup (METC-Mechanical Development), Leif Govin (METC-Mechanical Development).

We went through updates on issues from the original design review and discussed servicability of injectors, changes to design for cost reduction, and the design concept of dropping the grid into the intake manifold area.

The following is a list of issues/updates.

1. Labeling of part number to be on inboard side of housing (opposite of what is on prototype pieces). Positive terminal to be specified by '+ 24 V', and ground to be specified by '-24 V'.

2. A fitcheck of grid heater has been done at CDC. There were no issues on the assembly of the unit since the injectors are installed before the heater.

A big 'However' has been raised with the servicability of the injectors. The keeper or clamp that fits around the injector that is held down with a capscrew is very difficult to remove and to install. Current design of grid heater and keeper would mean the removal of the aftercooler and grid to reach the injectors. This would amount to about \$100 more per engine for average servicing of injectors.

This issue is to be treated as a CODE 1 Design issue. A G Kohrt will work on layout with movement of keeper.

3. Being that we are not guaranteed that the housing will make contact with the capscrews (by the inside surface of the holes) we are to have a ground strap connecting the ground terminal with the top of the intake manifold cover or aftercooler by the capscrews. Length of ground strap and gauge of wire is to be determined. Ring terminal end of ground strap is to fit under flange of capscrew and ground strap should be fully removable.

4. Warning label/ sticker (P/N 3927335) is to be put on grid heater on outboard side of housing. Is an aluminum foil type label with a removable sheet of plastic over it that can be peeled off after paint. Phillips Temro may apply label if the plastic sheet will remain intact through wash at plant. We will investigate whether CMEP puts this label through wash with current Chrysler intake heater or not.

5. Changes to the housing of the grid heater will be quoted by Phillips. The changes include changing from 6 pockets for the 12 steel holders to 2 pockets for 4 holders. This requires a new tension spring, a new holder design, and a slight change to the element bending pattern, plus the simplified housing. The performance should be the same. An upper restraint may need to be added



but will be relatively inexpensive.

9. Cold Cell Performance testing has been done on current product and the baseline of the Industrial Emissions engine is being base lined. Startability is currently not as good as expected. Plans are to be testing the grid heater by May 13.

10. This will also allow Stress to determine vibration spectrum so that Phillips Temro can do vibration work. Phillips Temro plans to do vibration tests with 2 pocket design with and without restraint.

11. Mechanical development testing is to be determined and is planned to be done on 2 pocket design.

12. A 205 amp relay is needed to allow the use of only one positive electrical terminal instead of two. There are many relays around for half of this current but we would like to make sure one large amperage relay will cost less than two smaller amperage relays.

13. Direction from Industrial Emissions NPIT to start design for 12 V system will be needed to pursue the 12 Volt application.

14. A design concept of an intake heater that has grids dropped into the intake manifold will be investigated for mid to later 95 timeframe. This concept will first need to be tested for air restriction. A mach up will be done for testing on flow bench.

15. Phillips Temro will also be sending temperature data on the grids and terminals to METC.

A. G. KOHRT (April Gulbrands)

DIST-\*GRID

Milloy, S C  
Weikert, J M  
Hovin, L E  
Hager, F M  
Abell, D J  
Long, D G  
Seal, R H  
Herlitz, D L  
DOWNING, D H  
Smith, B R  
LEBEGUE, J S  
Kloosterman, G C  
MARINO, T R  
Wagner, J W  
Inoue, S T

Virnig, D M  
Neil, S W  
CORT, A  
BUSCH, D A  
Abner, B G  
FRANZWA, R A  
Graham, D D  
CHIARAMONTE, M  
Taylor, P  
BEYER, S  
Dover, R G  
KRASZESKI, D J  
Yager, J H  
PATTERSON, J R  
BLASDEL, J C



DATE: March 23, 1994  
TO : R.A. FRANZWA  
FROM: A.G. KOHRT (April Gulbrands)  
SUBJECT: REF : Regarding the attached note

I sent the actual Grid Heater part to you or Danny Long. Danny's got it.

A. G. KOHRT (April Gulbrands)

DATE: March 22, 1994  
TO : Ms. A.G. KOHRT  
FROM: R.A. FRANZWA (RICH)  
SUBJECT: Regarding the attached note

April,

If you are referring to the Pro/E files, yes. If you are referring to an actual part, no -- I have not seen it. Should I be looking?

--Rich

R. A. FRANZWA (RICH)

CC : R.A. ROSSI

TAKEN-BY	STAT	DATE	TIME	FROM	NOTE-DATE
April Gulbrands		03/22/94	08:56	KOHRT, A G	03/22/94
Rich, did you receive the grid heater I sent down? (Ref PCR MR2837)					
*****					

6

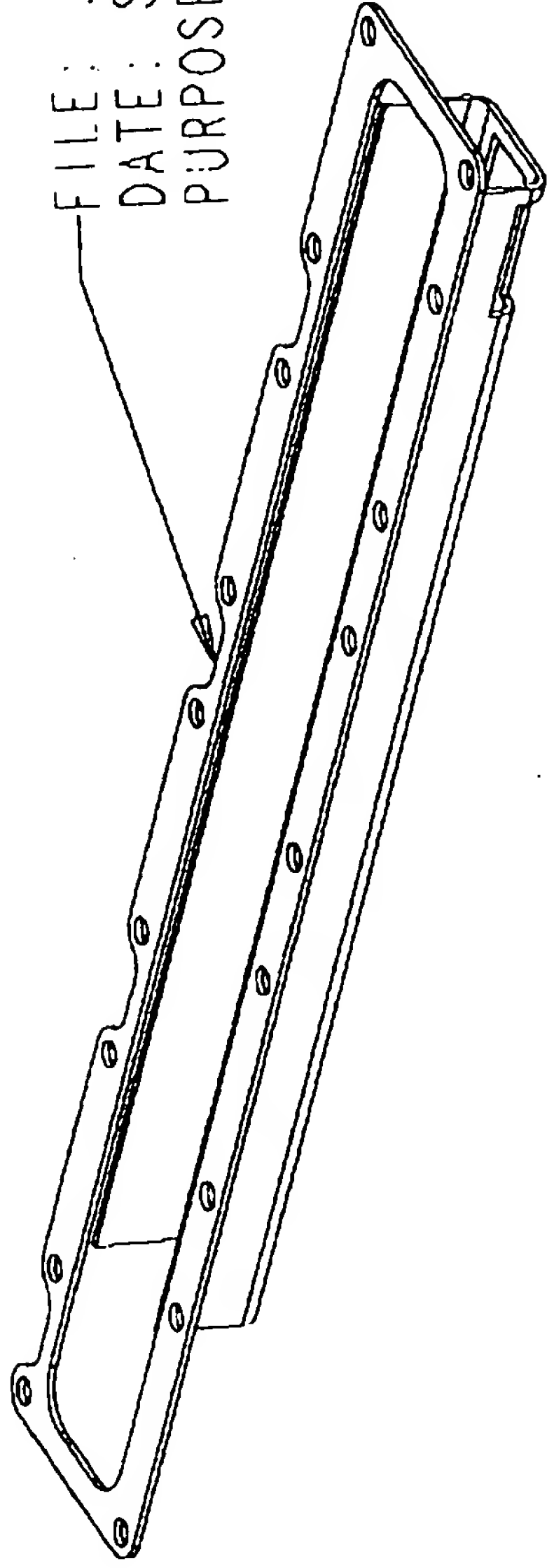
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TAKEN-BY	STAT	DATE	TIME	FROM	NOTE-DATE
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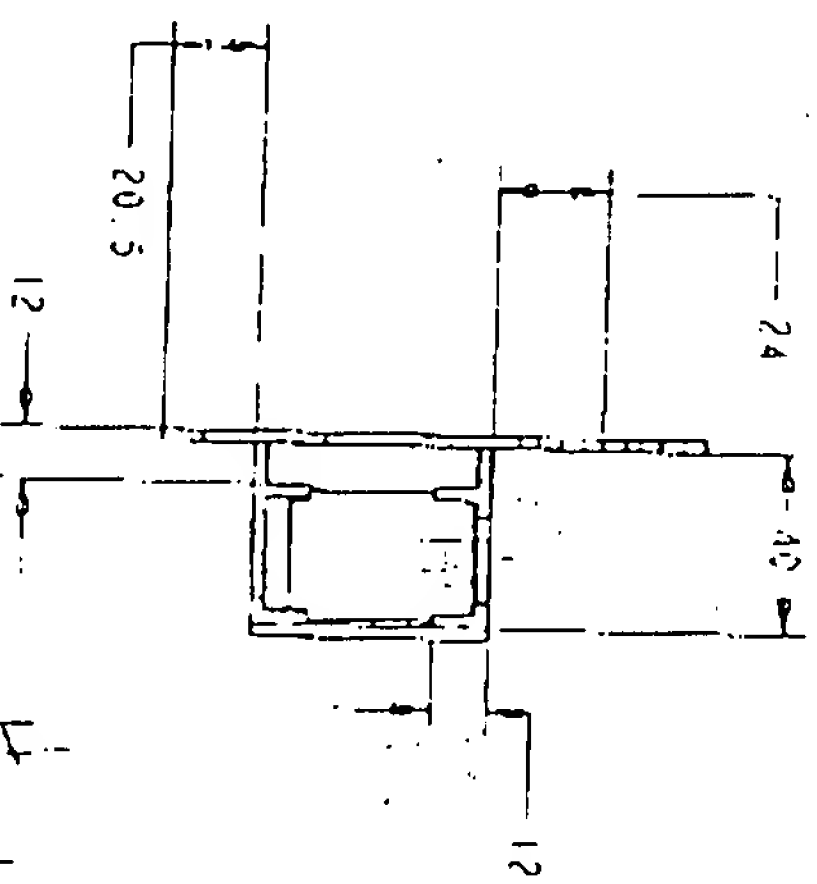
April Gulbrands		11/23/94	11:53	KOVRT,A G	11/23/94
The second prototype has been received today of the C series dropped down grid heater. This one looks like it's plated.					

\*\*\*\*\* THIS NOTE WAS FILED ON : 12/04/94 \*\*\*\*\*



FILE: /ojk/sep-7184-2-drop-grid.pr  
DATE: SEPTEMBER 27, 1994  
PURPOSE: REFINED CONCEPT

SCALE 0.305

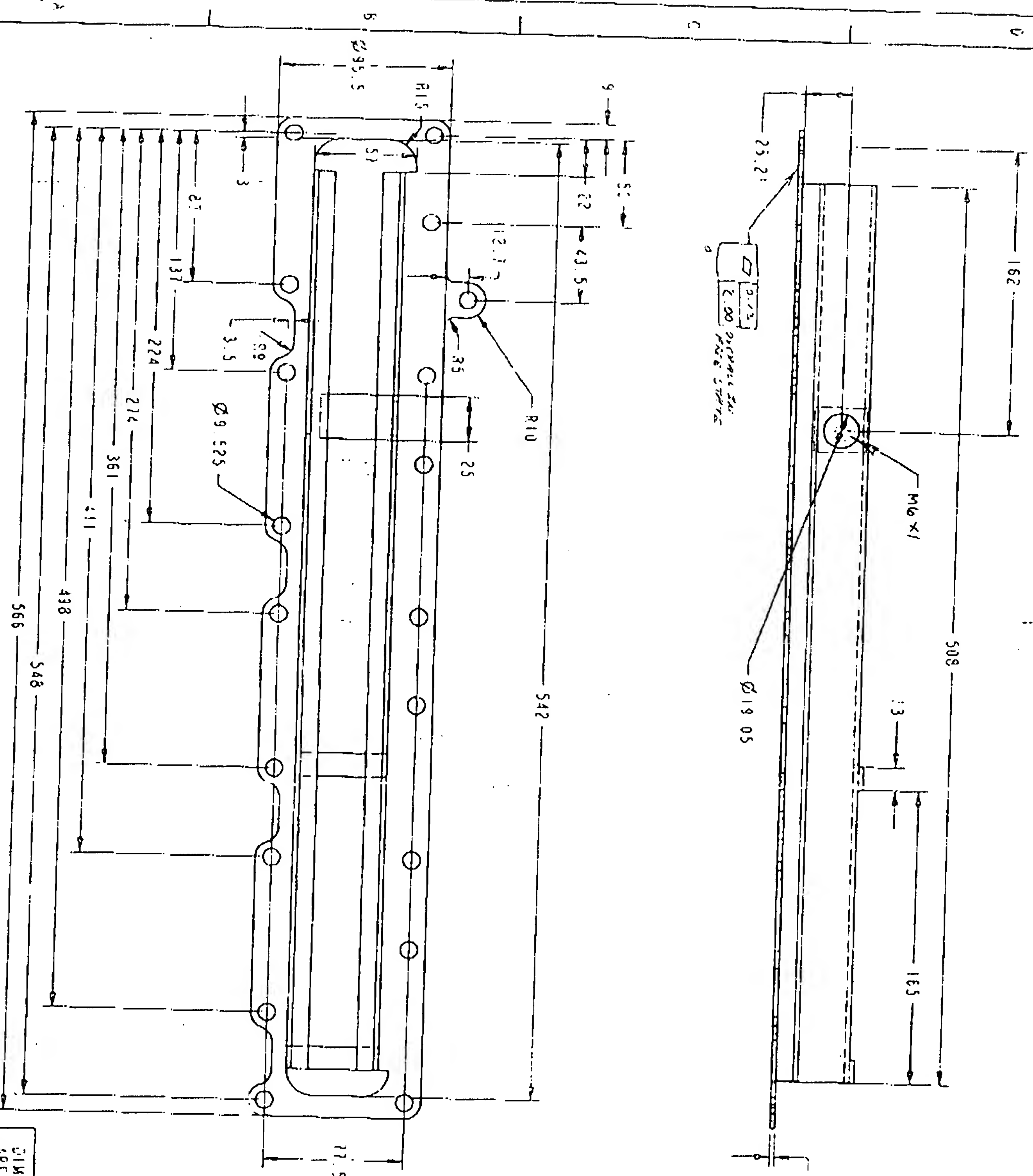


COCKE

ref. Hojier-air-crib is

# HEATH, ALI INIAE

CUKXINS CONFIDENTIAL



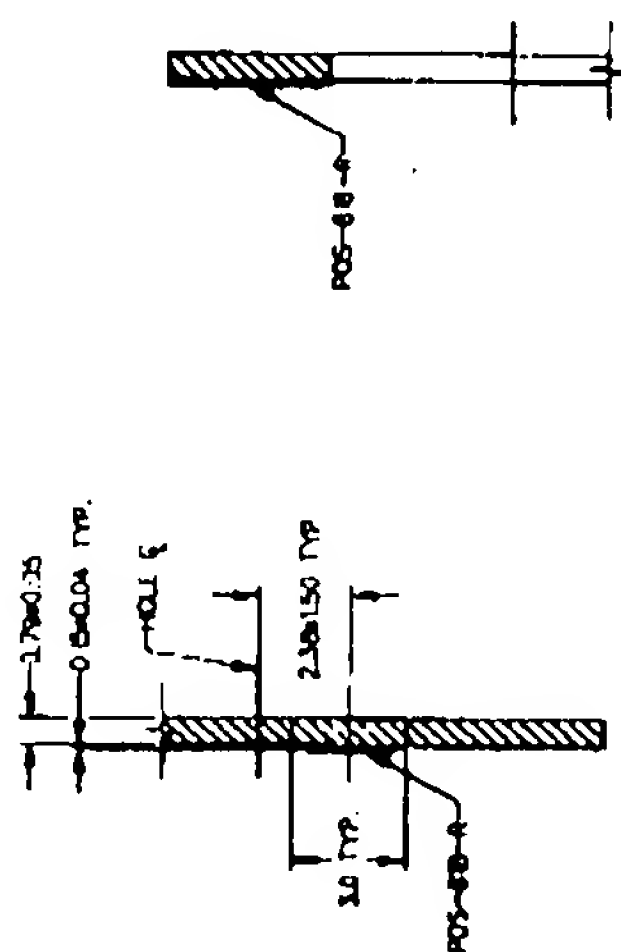


UNLESS OTHERWISE SPECIFIED TOLERANCES ARE  
TO BE AS SHOWN.

MATERIAL 34.005 10111-000 001000  
C-03317 005-000-1.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE  
TO BE AS SHOWN.

MATERIAL 34.005 10111-000 001000  
C-03317 005-000-1.



SECTION: A-A  
TEN TIMES SIZE

W  
C  
A

CLASSIFICATION OF DODGEE TERMS

●	CRITICAL
●	MAJOR
●	MINOR

LINE BELOW SYMBOL ● APPLIES TO SYMBOL  
LINE ABOVE SYMBOL ● APPLIES TO LINE  
NO LINE WITH SYMBOL ● APPLIES TO BOTH  
DESIGN SYMBOL : D. C. SYMBOL : D. C.  
DODGEE SYMBOL : SYMBOL

1. Name of the person	Mr. J. H. Smith
2. Date of birth	1910
3. Place of birth	London, England
4. Present address	123 Main Street, New York, N.Y.
5. Occupation	Teacher
6. Date of entry into the country	1915
7. Date of departure from the country	1916
8. Name of the vessel	SS. "Titanic"
9. Name of the captain	Mr. J. H. Smith
10. Name of the mate	Mr. J. H. Smith
11. Name of the steward	Mr. J. H. Smith
12. Name of the cook	Mr. J. H. Smith
13. Name of the barber	Mr. J. H. Smith
14. Name of the doctor	Mr. J. H. Smith
15. Name of the nurse	Mr. J. H. Smith
16. Name of the stewardess	Mr. J. H. Smith
17. Name of the cabin boy	Mr. J. H. Smith
18. Name of the steward	Mr. J. H. Smith
19. Name of the cook	Mr. J. H. Smith
20. Name of the barber	Mr. J. H. Smith
21. Name of the doctor	Mr. J. H. Smith
22. Name of the nurse	Mr. J. H. Smith
23. Name of the stewardess	Mr. J. H. Smith
24. Name of the cabin boy	Mr. J. H. Smith
25. Name of the steward	Mr. J. H. Smith
26. Name of the cook	Mr. J. H. Smith
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28. Name of the doctor	Mr. J. H. Smith
29. Name of the nurse	Mr. J. H. Smith
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33. Name of the cook	Mr. J. H. Smith
34. Name of the barber	Mr. J. H. Smith
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36. Name of the nurse	Mr. J. H. Smith
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43. Name of the nurse	Mr. J. H. Smith
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96. Name of the cook	Mr. J. H. Smith
97. Name of the barber	Mr. J. H. Smith
98. Name of the doctor	Mr. J. H. Smith
99. Name of the nurse	Mr. J. H. Smith
100. Name of the stewardess	Mr. J. H. Smith

**DO NOT SCALE THIS DRAWING**

Cummins Engine Company, Inc.

CASE INT MANF Q D COVER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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PRODUCT RELEASE  
TEXT SECTION

PRODUCT REL. NO: NOR2837-01  
PAGE: T-1

953068-056

1716

PROGRAM AUTHORIZATION NO:

REFERENCE DOCUMENTS

SUPPLEMENT TO:

ACA NO:

EJR NO:

WRITTEN BY: Kohrt, A G

B SERIES----- DESIGN mit STRESS mit MECH DEV mit PERF DEV mit

C SERIES----- DESIGN mit STRESS mit MECH DEV mit PERF DEV mit

MATERIALS mit QUALITY mit PRODUCIBILITY mit SERVICE mit

CHIEF ENGINEER mit PURCHASING mit PROD SUPPORT mit PARTS mit

FOR REVIEW AND APPROVAL ONLY  
-NOT AN "IMPLEMENTATION" DOCUMENT-

DRAFTER/CHECKER:

PURPOSE:

To release new air heater options for C series ELITE engines, AH 9048 and AH 9063.

To revise air fuel control options and engine configurations.

DISCUSSION:

An electric grid heater for C series construction engines was requested with PCR MR 2837.

A 24 and 12 volt design is being released. The electrical connection for these grid heaters is through the cylinder head. It is an M6 double ended capscrew isolated and fitted through a threaded plug.

The ELITE air fuel control (FE) options are being revised by taking out one M22 plug and putting it into an AH 9066 which will be a pointer option when no grid heater is specified.

Note to Applications: AH 9066 should be specified for all ELITE engine shop orders that will not have an electric grid air intake heater.

END OF TEXT

#2



CCE 'EDEA'  
ENGINEERING ACTIVITY INQUIRY

E/A NUMBER: ER 953068-056

RELEASE NUMBER:

REF ACA NUMBER:

E/A DESCRIPTION:

PRIORITY:

ORIGINATOR: KOHRT,A G

DATE WRITTEN: 02MAR95

TYPE PROCESSING:

PRODUCT FAMILY:

APPROVAL STATUS:

PROJ TRACKING NO:

TARGET DATE: MECH. TIE:

AGENDA DATE: PRINT ITEM:

PROBLEM RESOLUTION DATA:

STAT DATE COMMENTS

---N/A---

\*\*\*\*\*

\* PROCESS FUNCTIONS REQ COMPL \*

\* ---N/A--- \*

\* \*

\* \*

\* \*

\* \*

\*\*\*\*\*

ANALYST INITIALS:

WORK GROUP:

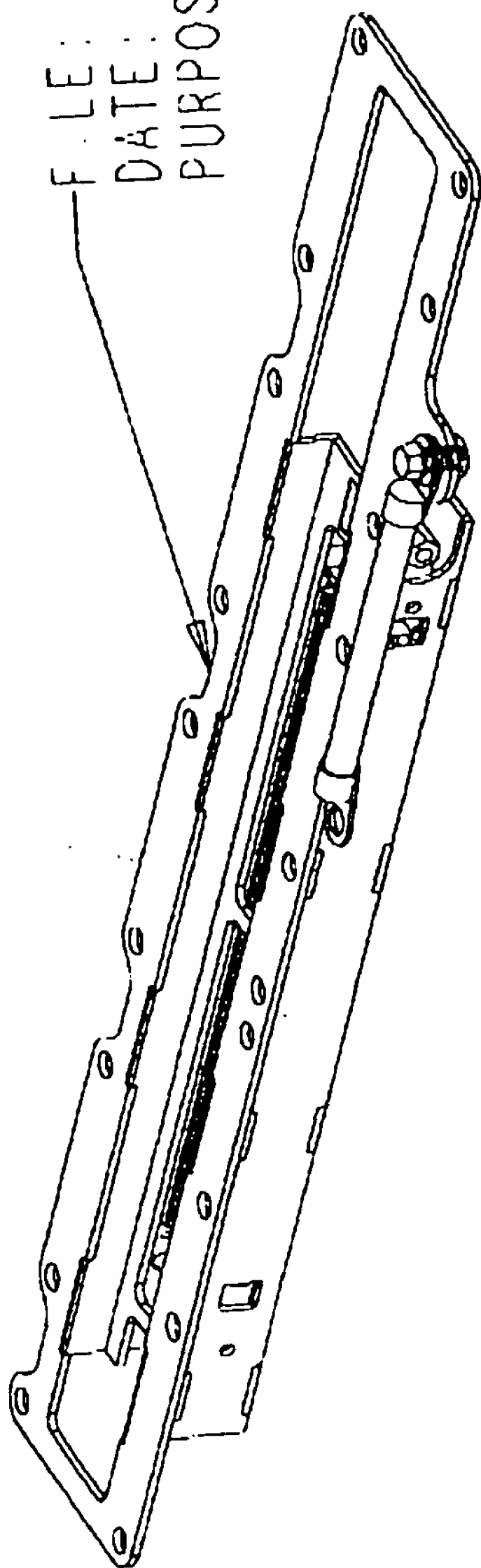
EA STATUS: RELEASED

STATUS DT: 15AUG95

RESOLVED

#1

FILE: /nparts/vol1t/3932087.asm.100  
DATE: JUNE 25, 1996  
PURPOSE: PRODUCTION DETAIL



CUMMINS ENGINE COMPANY  
FAX COVER LETTER

TO: Tim Brackett  
Sixbey, Friedman, et al  
fax: (703) 883-0370 phone: (703) 790-9110

FROM: April G. Kohrt  
2 VALVE Design

PHONE: 812 377 7875

HOME 812-378-9130

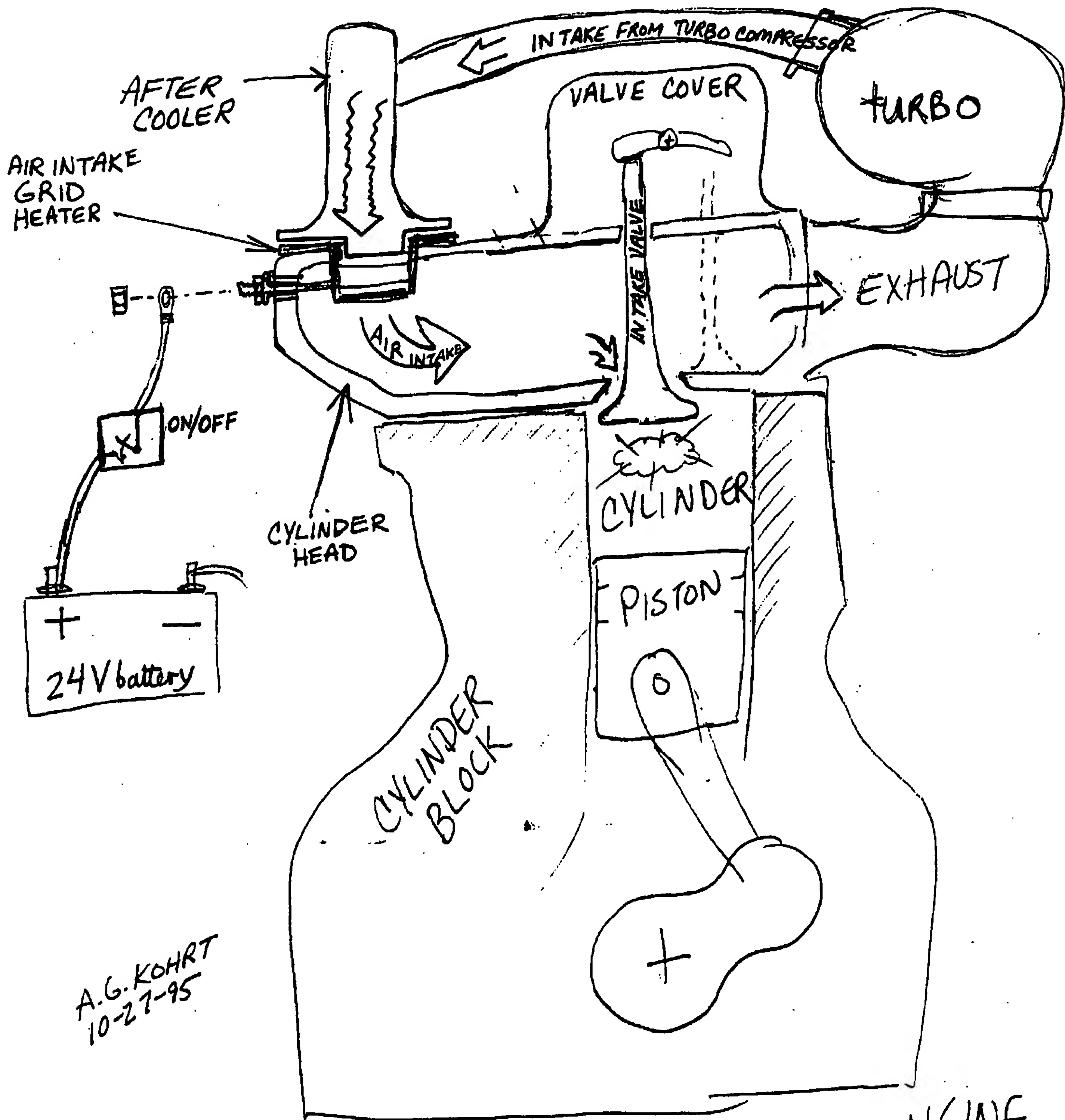
CUMMINS ENGINE COMPANY, INC.  
MIDRANGE ENGINE TECHNICAL CENTER  
1532 EAST 14TH STREET  
COLUMBUS, IN 47201  
FAX NUMBER: 812-377-8508

NUMBER OF PAGES TO FOLLOW: 4

DATE TRANSMITTED: 10-27-95

MESSAGE: Graphics for invention  
disclosure (Cummins ID 1583) Air Intake  
Grid Heater ---

- April G. Kohrt



REAR VIEW OF ENGINE

AFTER COOLER  
(OR INTAKE MAN-  
IFOLD COVER

AIR INTAKE HEATER

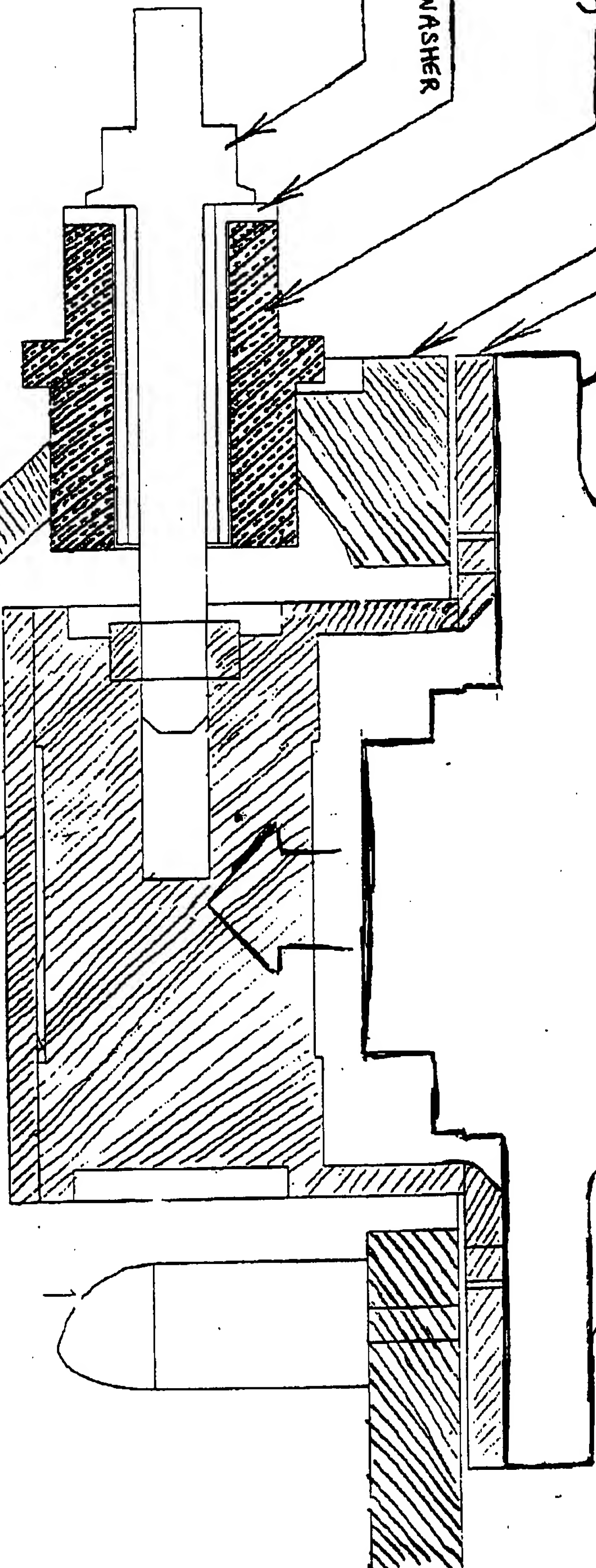
CYLINDER HEAD  
(INTAKE MANIFOLD AREA)

39 24789  
PLUG

39 30319  
INSULATING WASHER

39 30320  
JAPSCREW

AIR  
FLOW



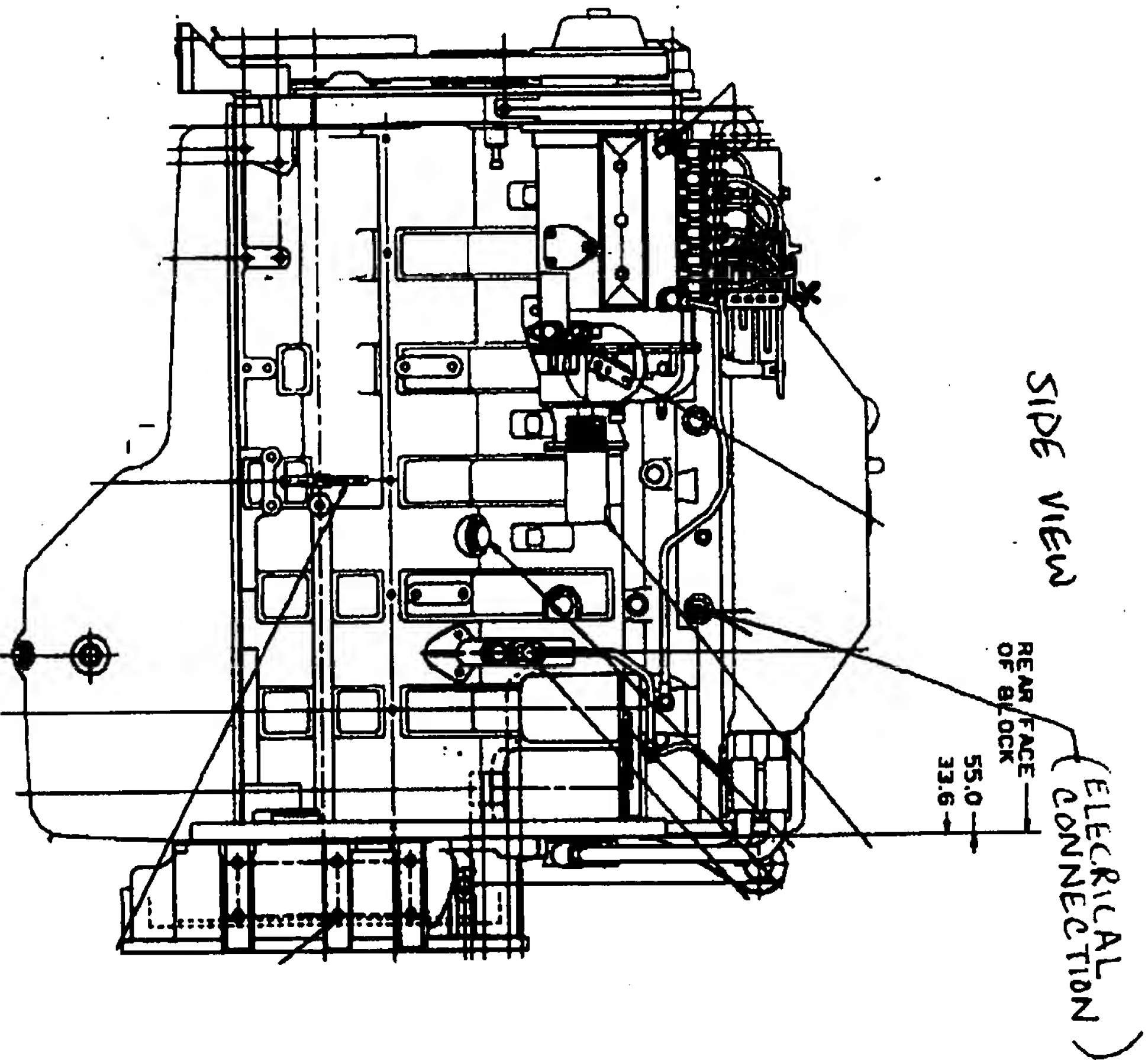
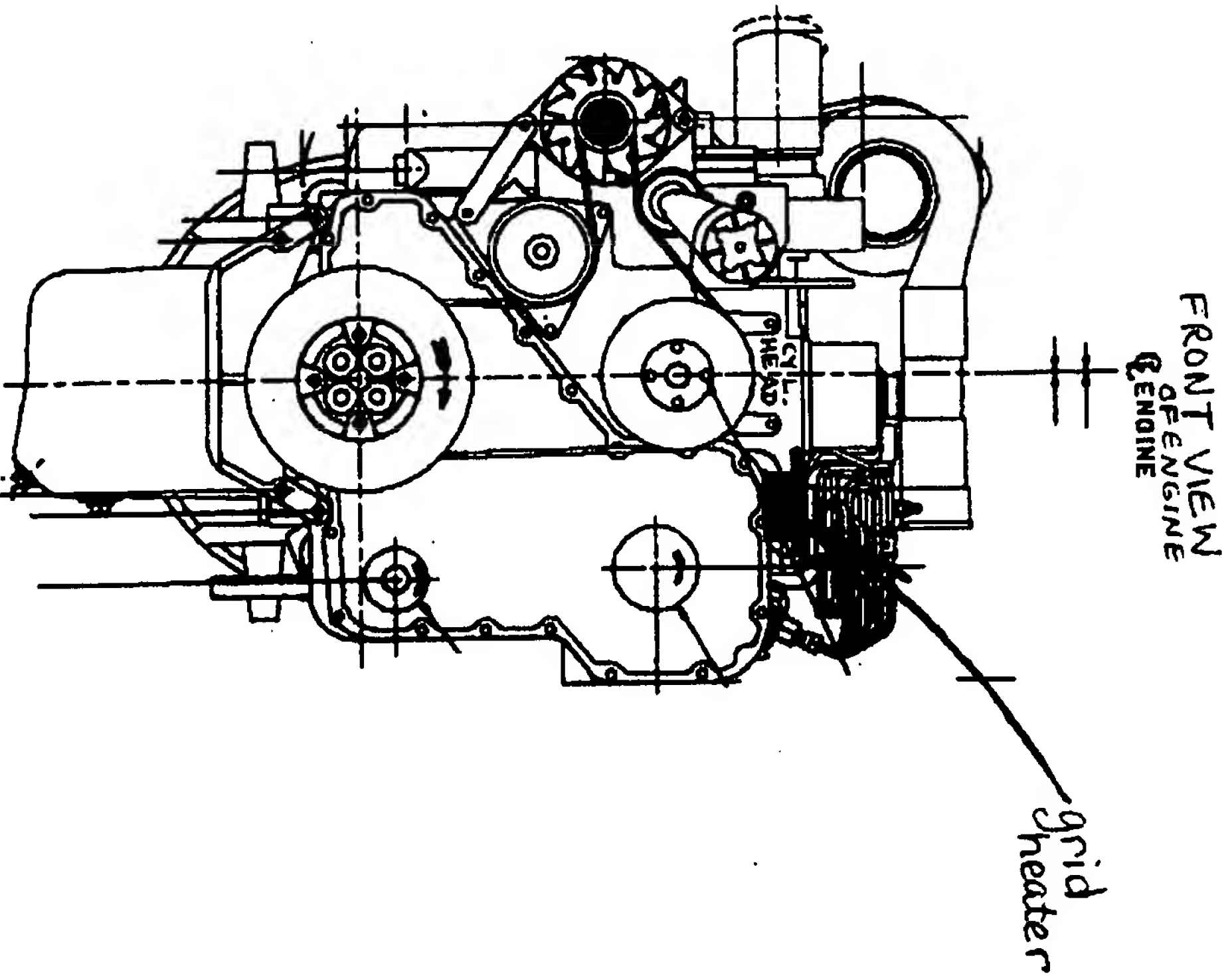
REAR VIEW  
OF ELECTRICAL  
CONNECTION OF

AH 9048

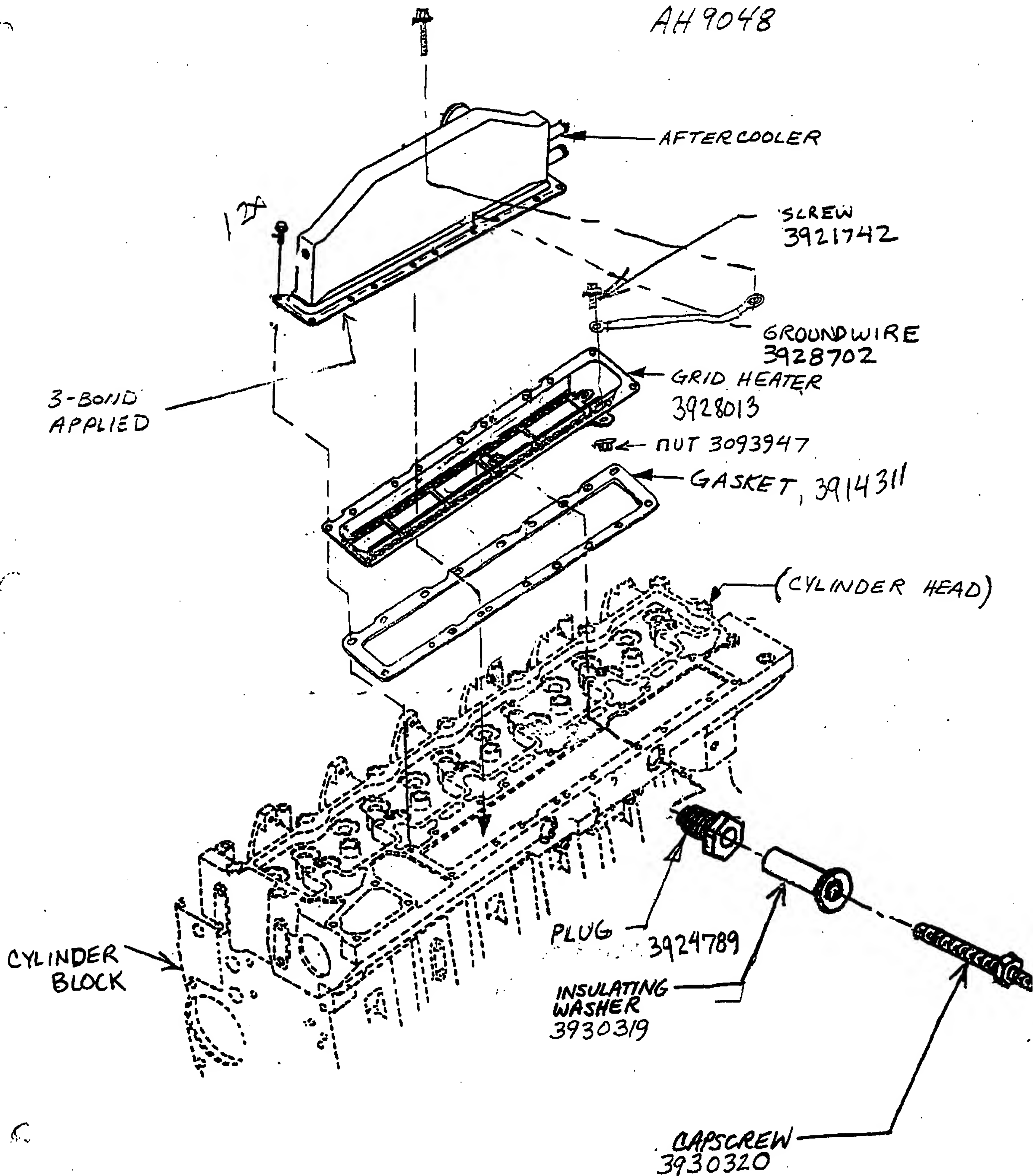
(24 VOLT 6CTA GRID HEATER)

A.G. KOHRT 7-3-95

FIGURE 2



6CTA  
AH9048



Cummins Engine Company, Inc.

DATE: October 11, 1994  
TO : DIST-GRID  
FROM: A.G. KOHRT (April Gulbrands)  
SUBJECT: REF : REF: C-Grid Htr Desig...

The Design Review for the C-Grid Heater (previously scheduled for this Thurs. 9-11) has been rescheduled again for

Tuesday, October 18, 1994, 1-3 pm  
in METC Conference Room 6.

We should have the initial prototypes from Phillips Temro for functionality-only testing, then. The teleconference Bridge Number is (812) 377 - 6155.

A. G. KOHRT (April Gulbrands)

DIST-\*GRID

Milloy, S C	Virnig, D M
Neil, S W	Hovin, L E
CORT, A	Hager, F M
BUSCH, D A	Abell, D J
Abner, B G	Long, D G
FRANZWA, R A	Seat, R H
Graham, D D	Herlitz, D L
CHIARAMONTE, M	Kloosterman, G C
KRASZESKI, D J	MARINO, T R
Yager, J H	PATTERSON, J R
Inoue, S T	GESSE, D M
CVELBAR, D A	Doup, Doug
Slimko, K A	UNSWORTH, J P
ANDREASEN, S M	THIMMESCH, J P
WAGNER, JOSEPH W	Kagley, L W

More..

DATE: October 10, 1994  
TO : DIST-GRID  
FROM: A.G. KOHRT (April Gulbrands)  
SUBJECT: REF: C-Grid Htr Desig...

In order to follow up and present some new information on the dropped down grid heater, a Design Review Meeting has been scheduled for Thursday, October 13, 1994 9:00 am to 11:00 am at Columbus in METC Conference room 8. I plan to have this as a teleconference and will let you know what the bridge number in another memo.

A. G. KOHRT (April Gulbrands)

DIST-\*GRID

Milloy, S C	Virnig, D M
Neil, S W	Hovin, L E
CORT, A	Hager, F M



BUSCH, D A	Abell, D J
Abner, B G	Long, D G
FRANZWA, R A	Seat, R H
Graham, D D	Herlitz, D L
CHIARAMONTE, M	Kloosterman, G C
KRASZESKI, D J	MARINO, T R
Yager, J H	PATTERSON, J R
Inoue, S T	GESSE, D M
CVELBAR, D A	Doup, Doug
Slimko, K A	UNSWORTH, J P
ANDREASEN, S M	THIMMESCH, J P
WAGNER, JOSEPH W	Kagley, L W

More..

DATE: October 3, 1994  
TO : DIST-GRID  
FROM: A.G. KOHRT (April Gulbrands)  
SUBJECT: Cancelled: C-Grid Htr Design Rev...

This Tuesday's meeting for follow up on C-Grid Htr Design has been cancelled.

A. G. KOHRT (April Gulbrands)

DIST-\*GRID

Milloy, S C	Virnig, D M
Neil, S W	Hovin, L E
CORT, A	Hager, F M
BUSCH, D A	Abell, D J
Abner, B G	Long, D G
FRANZWA, R A	Seat, R H
Graham, D D	Herlitz, D L
CHIARAMONTE, M	Kloosterman, G C
KRASZESKI, D J	MARINO, T R
Yager, J H	PATTERSON, J R
Inoue, S T	GESSE, D M
CVELBAR, D A	Doup, Doug
Slimko, K A	UNSWORTH, J P
ANDREASEN, S M	THIMMESCH, J P
WAGNER, JOSEPH W	Kagley, L W

More..

DATE: September 28, 1994  
TO : DIST-GRID  
FROM: A.G. KOHRT (April Gulbrands)  
SUBJECT: C-Grid Htr Design Review follow up

Please attend a follow-up meeting on the C-Series Grid Heater Design:

Tuesday, October 4, 1994, 1:00 - 3:00 at METC  
(2:00 - 4:00 pm CDC)  
in METC conference room 5.  
or Bridge number (812) 377-4007

A. G. KOHRT (April Gulbrands)

DIST-\*GRID

Milloy, S C  
Neil, S W  
CORT, A  
BUSCH, D A  
Abner, B G  
FRANZWA, R A  
Graham, D D  
CHIARAMONTE, M  
Kloosterman, G C  
MARINO, T R  
PATTERSON, J R  
GESSE, D M  
Doup, Doug  
UNSWORTH, J P  
THIMMESCH, J P

Virnig, D M  
Hovin, L E  
Hager, F M  
Abell, D J  
Long, D G  
Seat, R H  
Herlitz, D L  
DOWNING, D H  
KRASZESKI, D J  
Yager, J H  
Inoue, S T  
CVELBAR, D A  
Slimko, K A  
ANDREASEN, S M  
WAGNER, JOSEPH W

More..